

RetroGuide, a knowledge representation and execution system for clinical research informatics alerts based on workflow technology

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Representation and execution of research alerts is an important challenge in clinical research informatics. Many institutions address this with locally developed tools which are often designed specifically for the healthcare domain. Despite initiatives such as BRIDG or Arden syntax, there is no widespread use of a single standard or toolkit and no significant alert logic sharing across EHR or CTMS vendors. We have addressed the problem of research alerts representation and execution using workflow technology (WT). WT has been used outside healthcare in many industries (e.g., banking, manufacturing or shipping) and has a well established set of standards, including the XML process definition language (XPDL). We demonstrate its use for representation, sharing and execution of research alerts. In contrast to BRIDG or Arden Syntax standards, there are several commercial workflow software packages available on the market today, as well as open source options.

Our framework, called RetroGuide, at its core utilizes the open source Enhydra workflow suite. Use of RetroGuide involves three phases: (1) *editing*: a user authors a research alert in a graphical workflow editor (in WT terms such an alert module would be called a process definition). It uses a step-based paradigm to represent logical steps and operates on a single patient level. (2) *retrospective testing*: a user executes the flowchart on a testing cohort of patients. A set of audit trail reports generated by each node in the flowchart offers insight into how well the alert performs on retrospective data. This alert testing step is optional and may not be required for simple alerts. For complex alerts, it allows fine tuning of trigger or interim alert logic and gives the user the ability to

explore and fully utilize available coded EHR data related to the alert logic. Users can go through several iterations of alert authoring and testing. (3) *deployment (prospective use)*: a user loads the module into the engine and registers all trigger or relevant EHR events with an event listener component. The deployed modules will trigger, respond to further relevant events and depending on the logic eventually perform the user-authored intervention action (active or passive alert). Our exhibit will present implemented feasibility case studies of deployed research alerts at Marshfield Clinic. We believe other CTSA may be interested in using or adapting this tool.

The RetroGuide graphical modeling paradigm has been evaluated in a prior study at Intermountain Healthcare (retrospective execution) with favorable results indicating high user friendliness of the flowchart-based logic modeling [1]. We have demonstrated the same use with EHR data at Marshfield Clinic and fully implemented the prospective mode of functionality.

Use of the workflow temporal model, can greatly facilitate the identification of subjects for T1 translational studies (SG 1), which are often based on responses to sequences of prior treatments. We are also experimenting with extensions to the RetroGuide paradigm so that it can utilize other sources of relevant data (e.g., CTMS or research genomic data), additional analytical technologies (e.g., NLP services) and represent non-alert algorithmic logic (e.g., algorithms abstracting phenotype from coded EHR data - complex named entity recognition).

References

- [1] Huser V, Rocha RA, Narus SP Evaluation of a flowchart-based EHR query system: A case study of RetroGuide, J Biomed Inform 2009; doi:10.1016/j.jbi.2009.06.001
- [2] RetroGuide project website, Available at <http://healthcareworkflow.wordpress.com>

Additional data:

System architecture figure

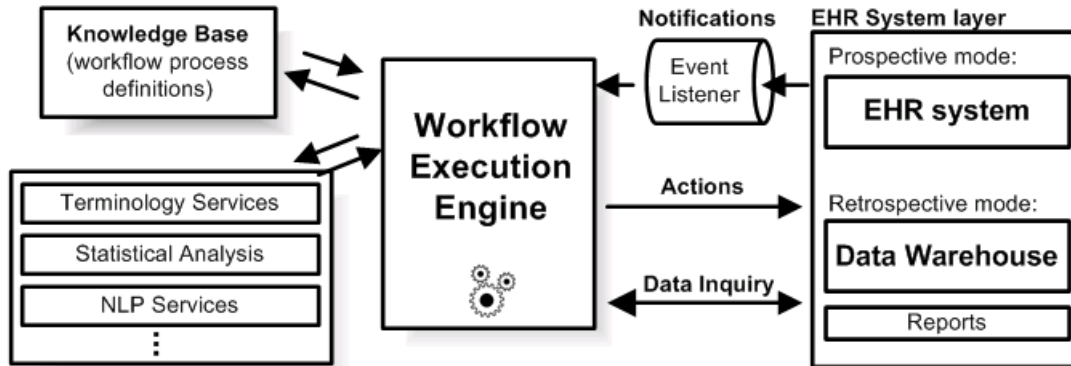


Figure 1. Diagram of RetroGuide architecture showing retrospective and prospective mode

Alert Example:

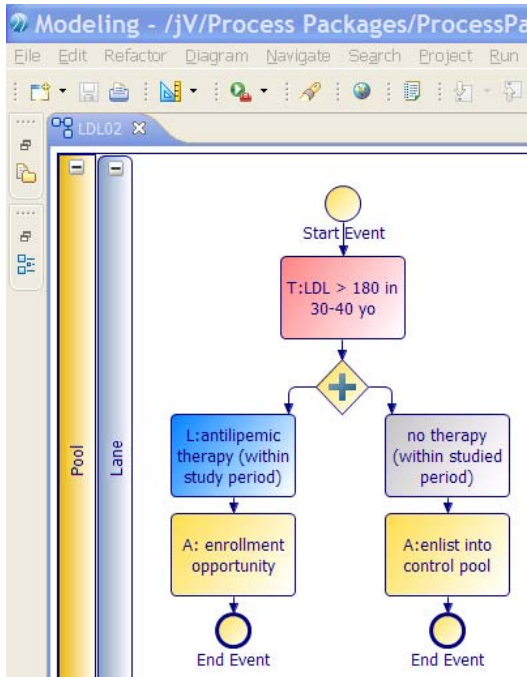


Figure 2. Cholesterol domain research alert example. Meaning of abbreviations in node titles are: T: Trigger; L: Listen event; A: Action event)